Hydro Electric DEVELOPMENT

HADLEY FALLS STATION

HOLYOKE WATER POWER COMPANY · HOLYOKE, MASSACHUSETTS

HADLEY FALLS STATION

THE completion of this new 15,000 kilowatt hydro-electric development, the Hadley Falls Station, marks another stride forward in the century-long development of the Connecticut River at Holyoke by the Holyoke Water Power Company and its predecessor companies.

It was in 1847 when a group of New England men stood on the west bank of the river at the little hamlet of Ireland Parish and dreamed of the possibilities of developing the energy of the waters as they poured over the "great falls" and then swept onward to the sea. They visualized a dam to impound the waters of the river . . . a series of canals that would bring power to industry . . . a city of thousands of people working and living together, making products that would reach around the world.

These men then banded together for the purpose of making their dream come true. They purchased 1100 acres of land . . . land confined within the graceful curve of the river . . . on which a city of the future was to stand. This city, which is now Holyoke, was then laid out on paper before a shovelful of earth was turned. When these men were sure their ideas were sound, they proceeded with the construction of a dam, canal system, and mills to use the created water power. This tremendous project attracted to Holyoke the building skills of men from the length and breadth of New England as well as Canada, men who disregarded the California gold rush of the time to help in creating the beginnings of this city.

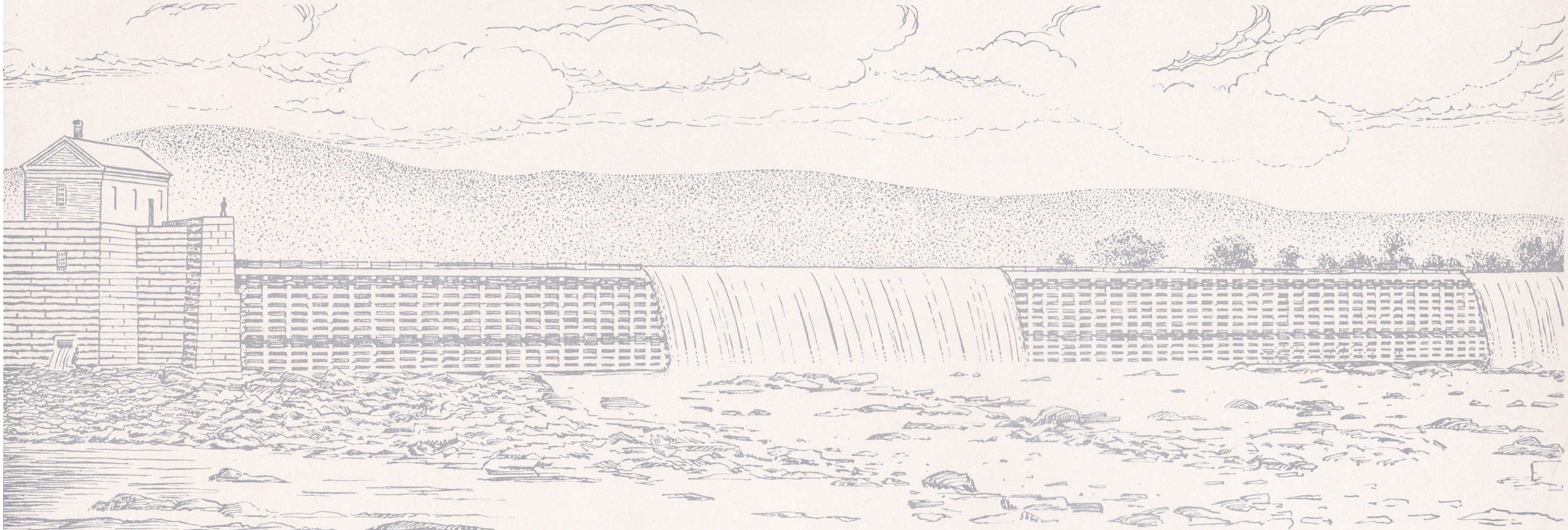
In record time these workers completed the dam and a portion of the canals . . . constituting, for that period, one of the engineering wonders of the nation. The water power that was thus created has been, for the past century, the foundation stone of many of the industries of Holyoke, industries employing thousands of people. It was no idle dream of our forefathers. Their visions of an industrial city utilizing the water power resources of the Connecticut River came true.

Through the intervening years since 1847, the expansion of the canal system continued and the water power generating equipment in the Holyoke installations became increasingly modernized and more efficient.

The latest hydro-electric development of the Holyoke Water Power Company, its Hadley Falls Station, represents the culmination of two and one-quarter years of active construction work. The following pages show the work of building this project in its many different stages of development. Herein is recorded the accomplishment that has resulted from the close coordination of invested capital, engineering planning and construction skill. Thus the continuing development of the Connecticut River at Holyoke moves onward.

HOLYOKE WATER POWER COMPANY · HOLYOKE, MASSACHUSETTS

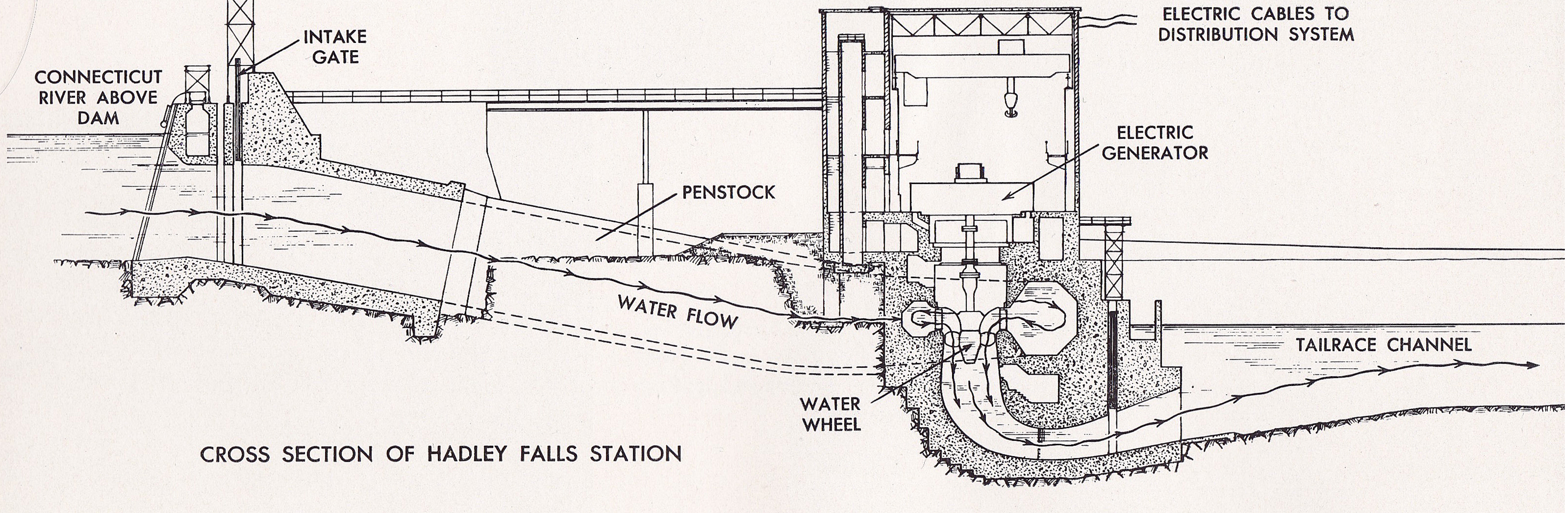
NOVEMBER, 1951 · ROBERT E. BARRETT, JR., President



HEART OF THE WATER POWER PROJECT IN 1852 — THE WOOD DAM AS IT THEN APPEARED. THIS STRUCTURE WAS SUPERSEDED BY THE PRESENT STONE DAM IN 1900.

"* * * Enterprise, Capital and Mechanical Skill; Enterprise to conceive the plan, Capital to furnish the means and Engineering skill to accomplish the work. It is these and not the fable of necromancy that have planted themselves below the falls of Hadley * * * and thus laid the foundations of a city, which will yet, with its suburbs spread for miles along the bank and be felt in the enhanced value of every farm in the country."—*From a speech by the* HONORABLE EDWARD EVERETT, *Governor of Massachusetts, in October, 1852, at the Agricultural Society Dinner in Northampton.*

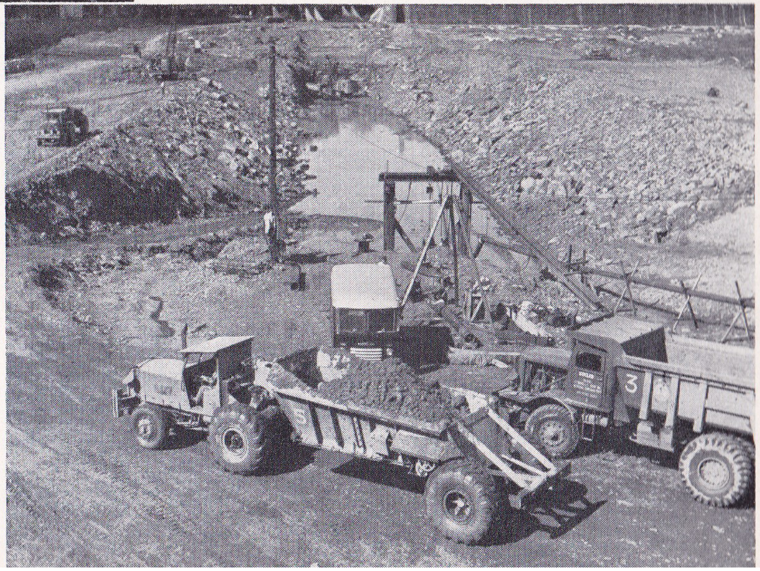
THE NEW PROJECT AT A GLANCE . . . The immense amount of work shown on the following pages was necessary to bring the flow of the Connecticut River to the water wheel, or turbine, thus turning an electric generator, before discharging itself downstream.



CROSS SECTION OF HADLEY FALLS STATION

ON THE THRESHOLD of action, a power shovel stands just above the South Hadley bridge, facing the site of the new hydroelectric project. It was August 22, 1949, and excavation for the tailrace channel began the next day.

INITIAL PHASE of construction found the upper end of the tailrace taking shape amid the rumble of earthmoving machines like those in the foreground. Cranes, power shovels, and electric pumps also played leading roles. The Holyoke end of the dam is at the upper right.



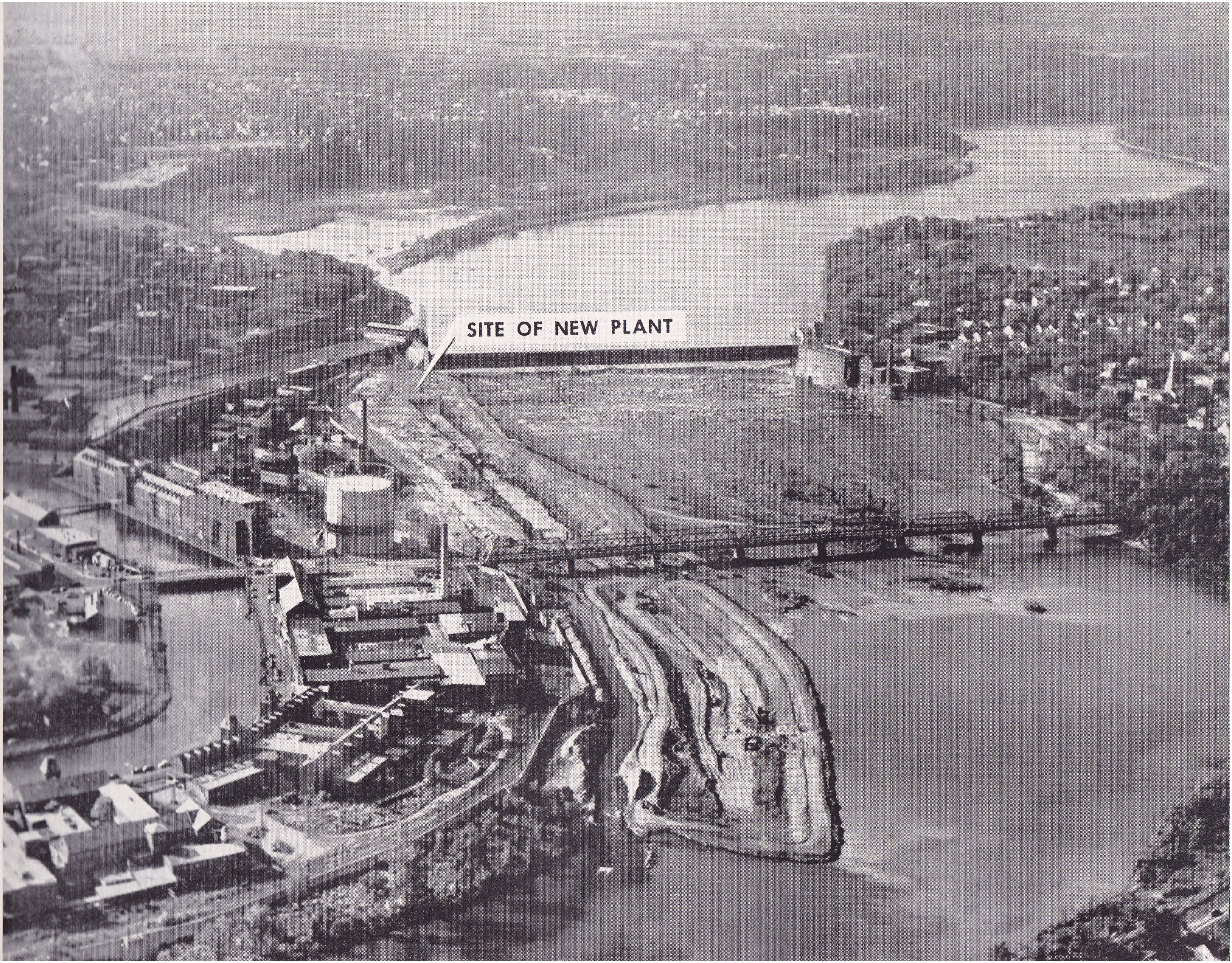
ROCK LEDGE in the path of the channel called for dynamiting. Charges were lowered into holes bored by the mobile, compressor-driven drills shown above. The South Hadley bank of the river is in the background.

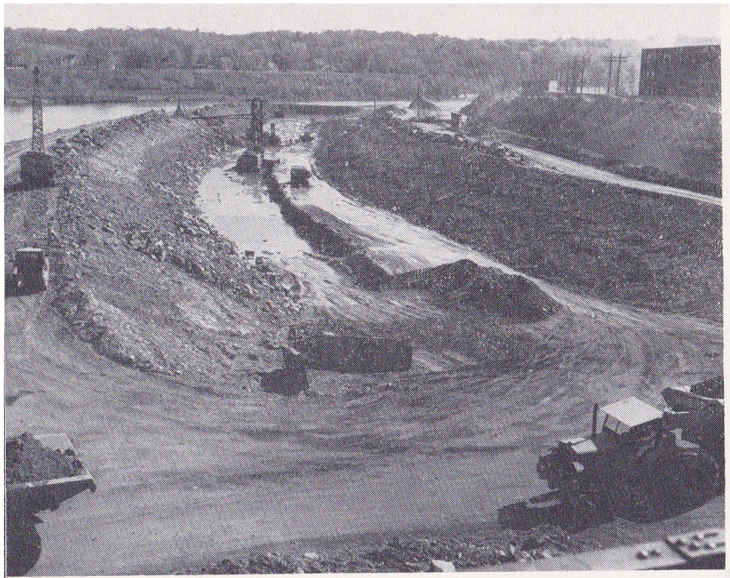
REMNANTS after the dynamite blasts were hauled away to be used as a sturdy lining, or rip-rapping, for the sides of the tailrace channel. Mt. Tom peeks over the dam at the upper right.

AERIAL VIEW (*right*) shows the tailrace nearing completion both above and below the South Hadley bridge (*center*). Only the portion directly under the bridge is yet to be excavated. The site of the new power house is to the left and just below the dam. A portion of the second level canal is at the lower left of the photo, while the first level canal leads from the gatehouse, to the left and just above the dam.

EARLY SNOW, on December 5, 1949, found the rip-rapping in place along most of the upper tailrace. Electric pumps like the one at the center were used to keep seepage at a minimum on the channel bed.

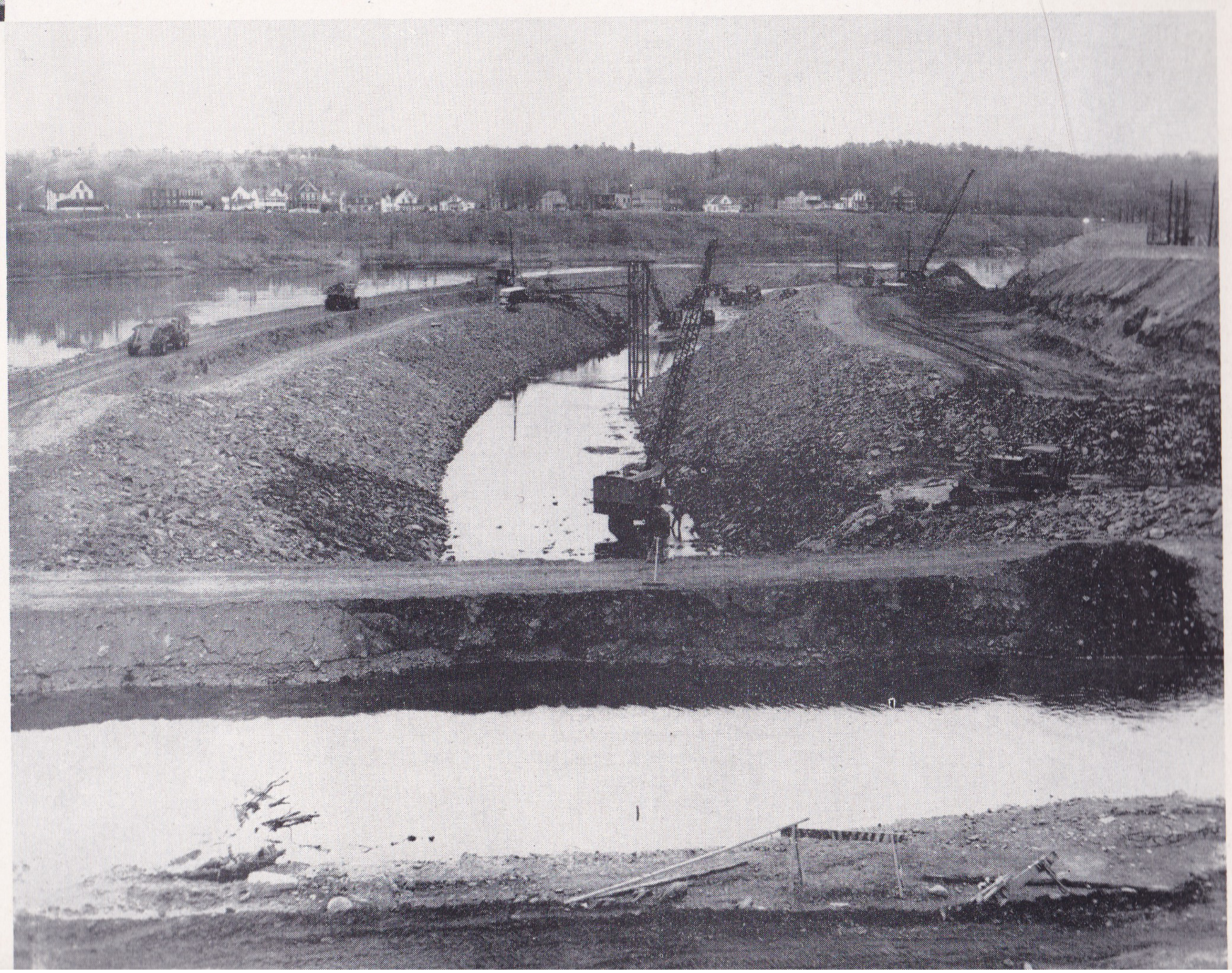
WELL SUBMERGED were the riverbed trails traveled by these and other earth movers during the project's first winter season. Excavated rock and dirt were carried across the river to form a protective barrier for a proposed flood dike on the South Hadley bank. This snow-dotted view is from under the South Hadley end of the bridge, looking upstream.


SITE OF NEW PLANT

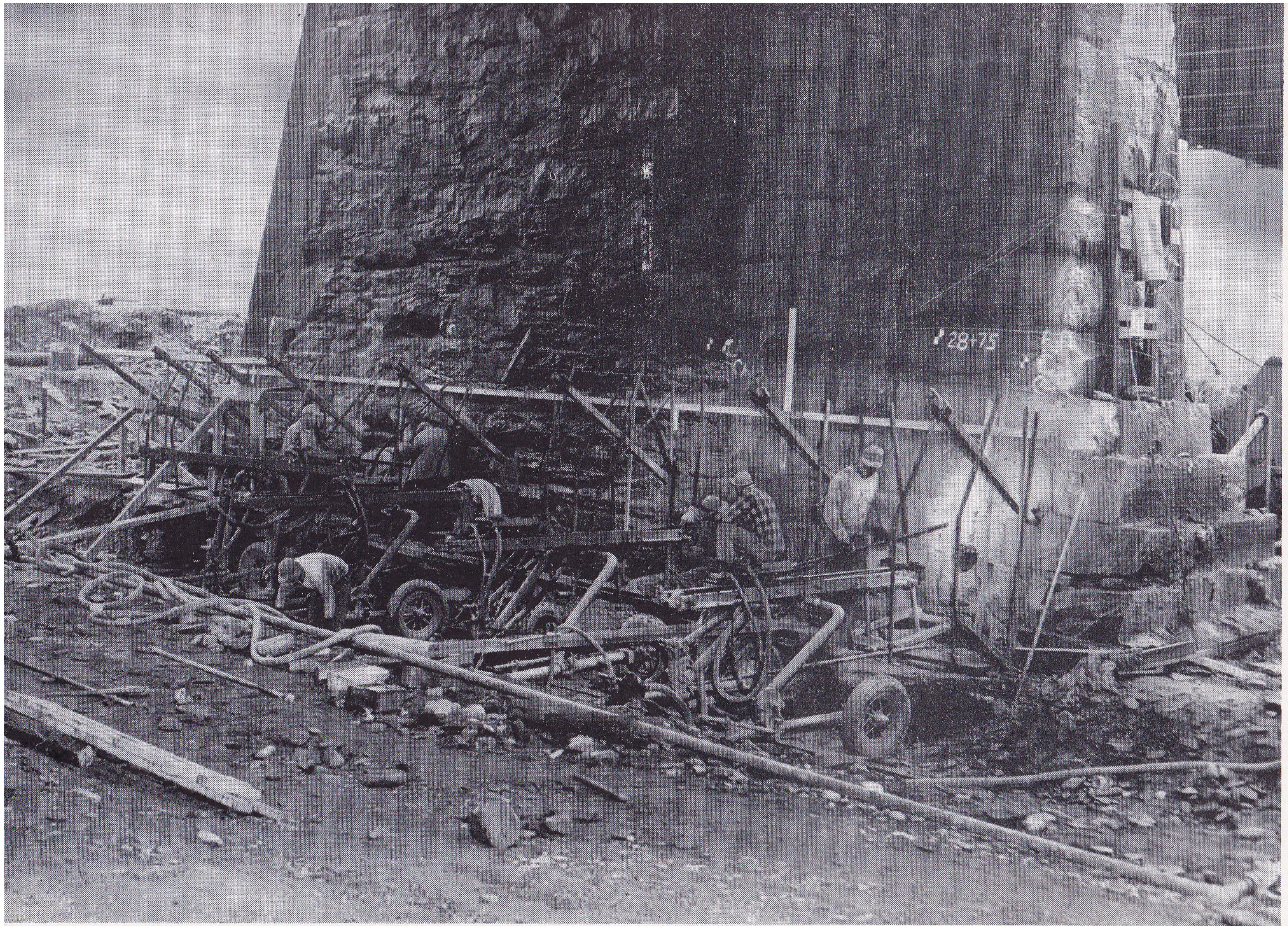


REMOVAL OF DIKE at the lower end of the nearly-completed tailrace allowed the river water to back up and conceal the rock-lined flanks of the channel. At the right, just beyond the dike in the foreground, is the discharge coming from the second level canal through the waterwheel of the Valley Paper Company.

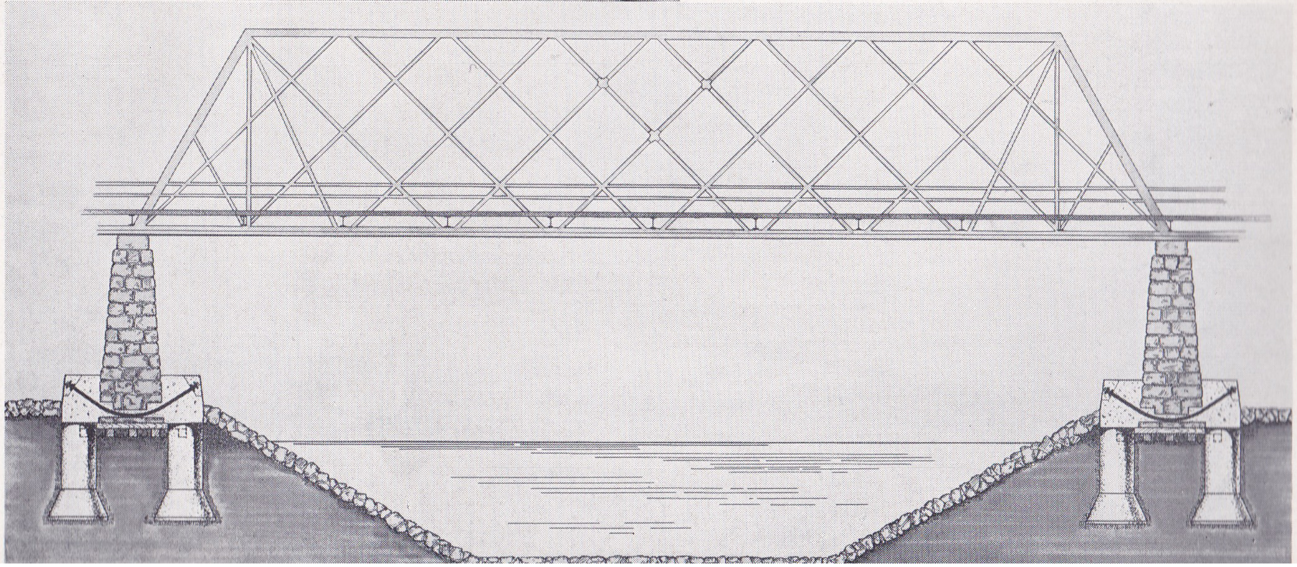
LOOKING DOWNSTREAM from the South Hadley bridge, the lower and shallower portion of the tailrace is seen curving with the course of the river.



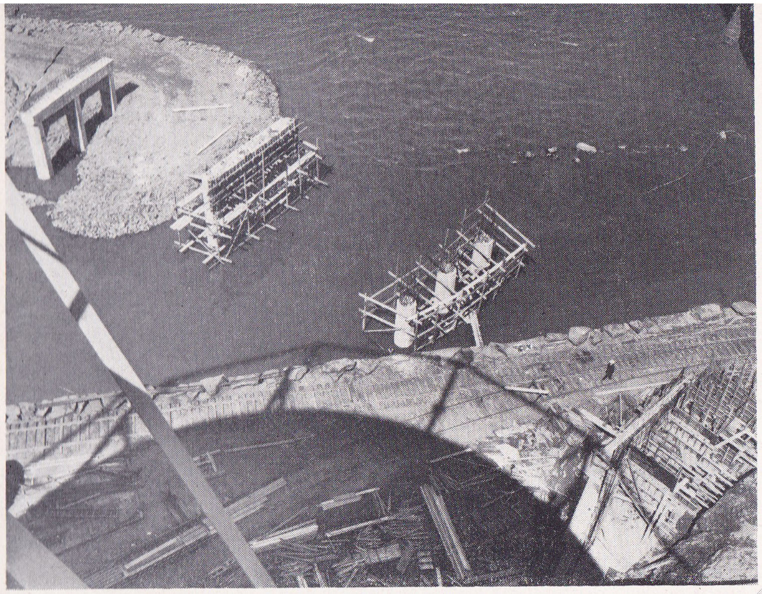
RIP-RAPPING of the lower tailrace was done with the aid of dikes (*foreground and background*) and pumps (*in scaffolding*). Homes in North Chicopee are across the river in the far background.



UNUSUAL CONSTRUCTION was involved in the cradling in steel of the two South Hadley bridge piers between which the tailrace was to run. Steel hangers, later to be imbedded in huge, pillar-supported concrete beams, are shown protruding from one of the bridge piers. Dry weather and a concentration of drilling equipment was demanded by the project.



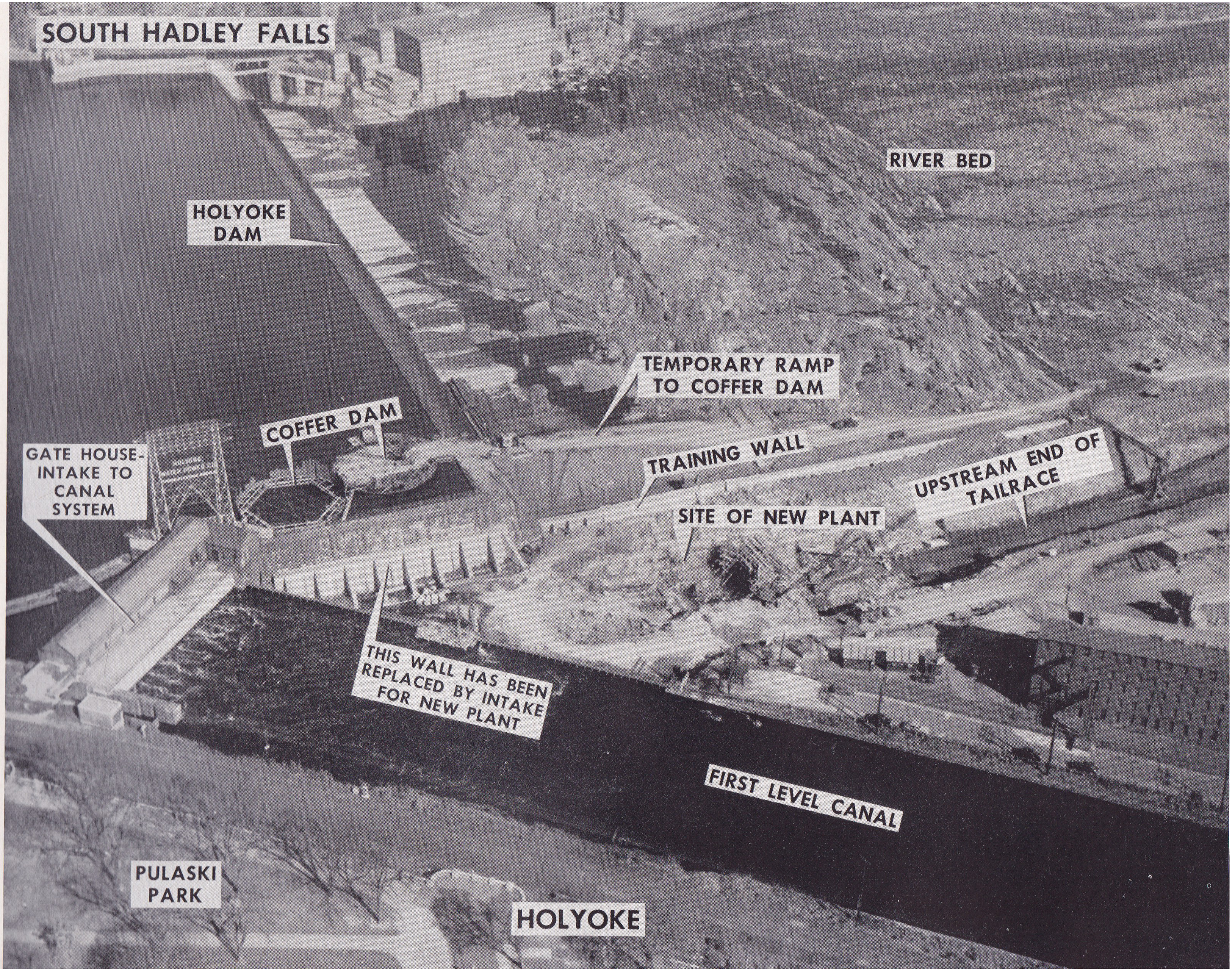
CROSS SECTION of the pier foundation project shows how the weight of the bridge was shifted to the hangers and beams, thence to the concrete pedestals, which were sunk to a depth of fifteen feet.



IMPORTANT ACCESSORY in the hydro-electric project is the bridge linking the Holyoke bank of the river with the road, built of excavation mateials, that parallels the Holyoke side of the tailrace above the South Hadley bridge. The new structure spans the outlet from the No. 2 Station of the Company and the adjacent spur track of the New Haven Railroad.

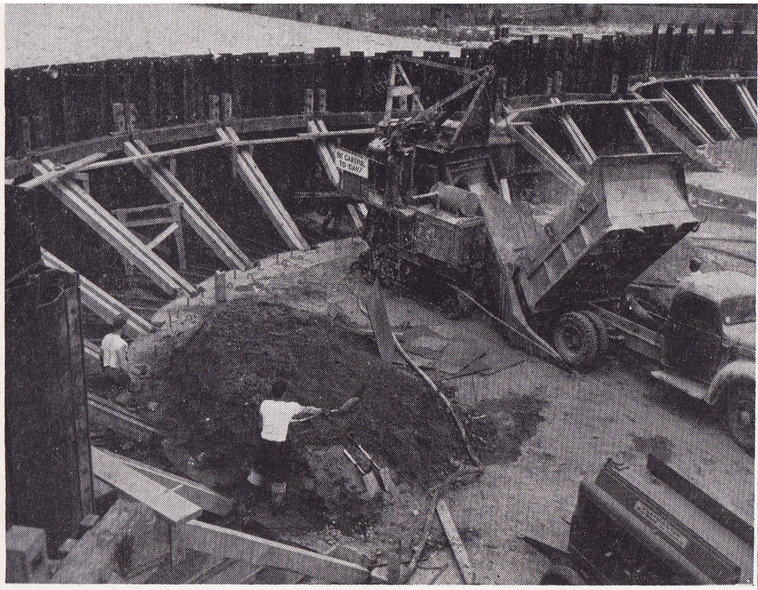
The views on this page show the bridge job in an early stage (from atop the gas holder of the Holyoke Gas and Electric Department) and after completion (from behind the city's floodwall, near North Bridge Street).

SHIFTING SCENE centers around the new powerhouse site, as the project passes the tailrace stage. The two cells of the temporary coffer dam were among the largest used in engineering history, measuring seventy-six feet, five inches in diameter. Main features of the project are keyed in the aerial view at the right.


SOUTH HADLEY FALLS
RIVER BED
HOLYOKE DAM
TEMPORARY RAMP TO COFFER DAM
COFFER DAM
GATE HOUSE-INTAKE TO CANAL SYSTEM
TRAINING WALL
UPSTREAM END OF TAILRACE
SITE OF NEW PLANT
THIS WALL HAS BEEN REPLACED BY INTAKE FOR NEW PLANT
FIRST LEVEL CANAL
PULASKI PARK
HOLYOKE

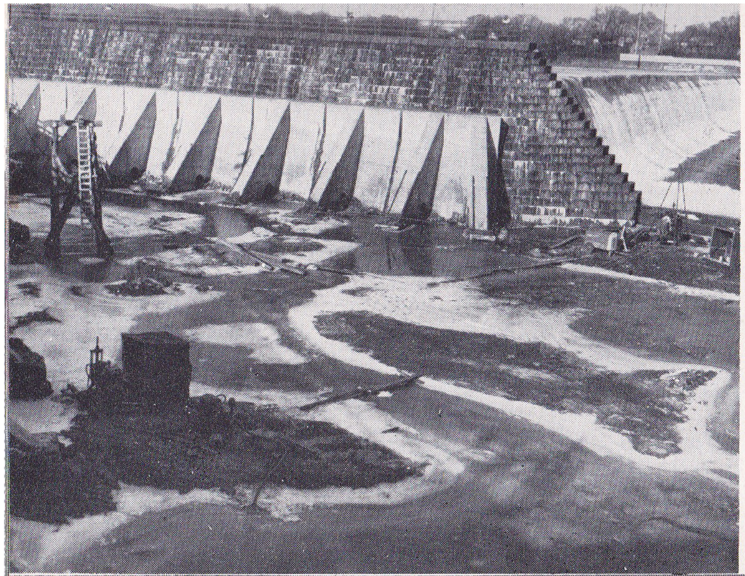
UNDERWATER SURVEY of the river bottom by professional divers was a preliminary to the coffer dam construction. The coffer dam served to stem the river waters while the fifty-year-old abutment at the Holyoke end of the dam was being replaced with the new headworks.

INTERLOCKING STEEL PILES ringing one cell of the coffer dam are in place, and the cell is being filled with earth and rock to make it firm against the force of the Connecticut River.

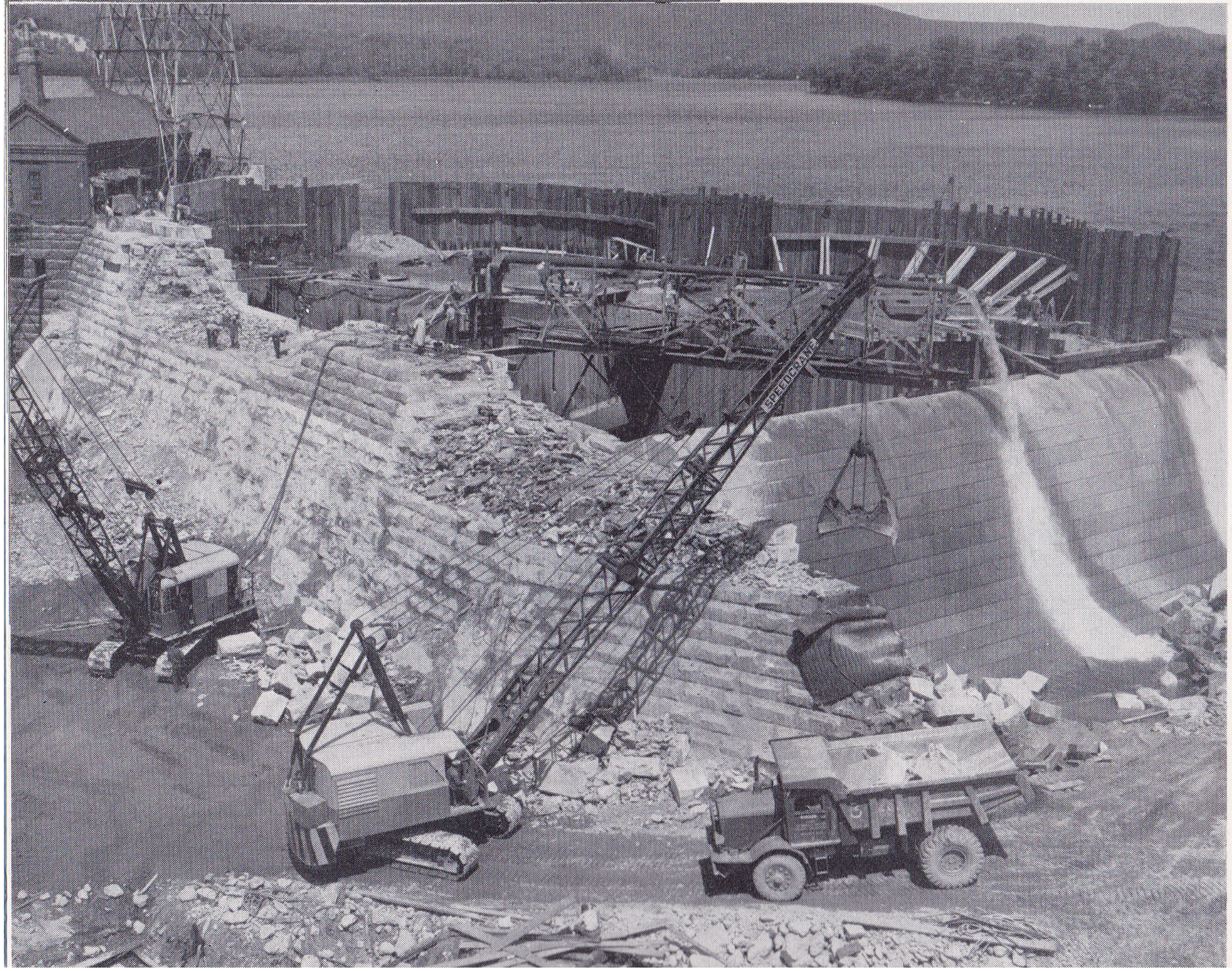


MASSIVE DIMENSIONS of the coffer dam allowed heavy equipment to operate on top of its cells. So accurate were the workers on the project that the final steel pile slipped snugly into place on the outside of the cellular dam.

SMALL CANYON is formed between the coffer dam (*right*) and the old abutment as a pump (*center*) keeps the area clear of water while preparations are made for removal of the abutment wall.

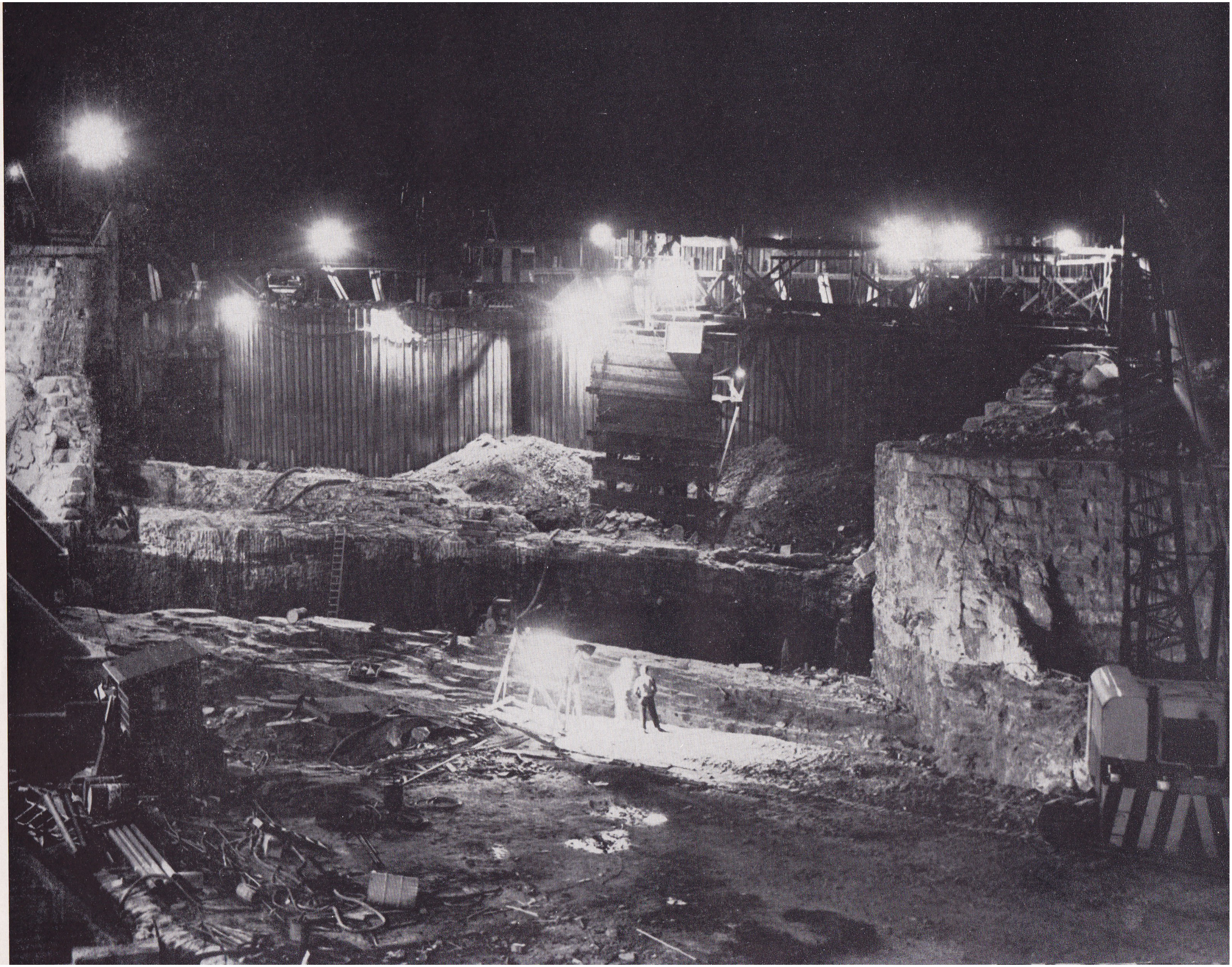


LATERAL VIEW shows the rugged character of the old abutment, which served from the time the masonry dam (*upper right*) was completed in 1900 until the coffer dam was constructed.

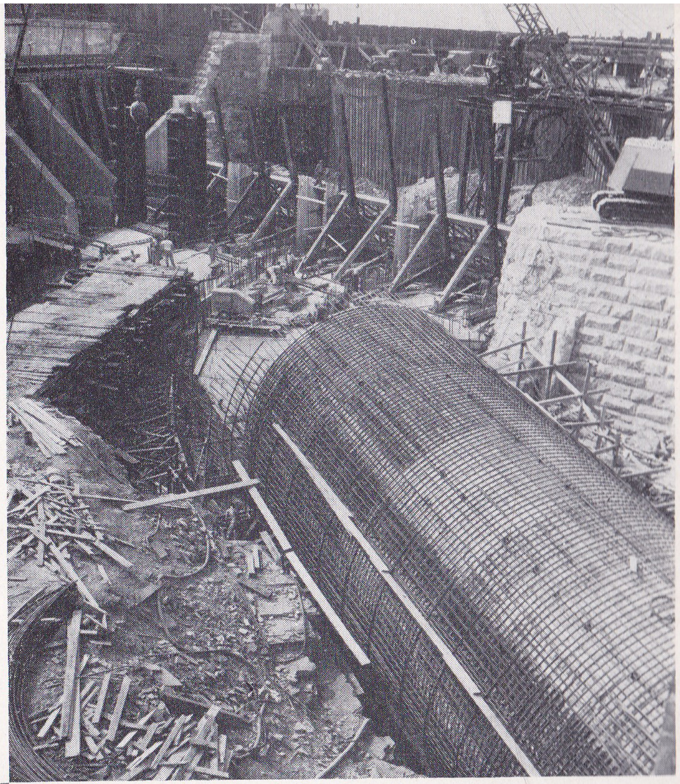


GIVING WAY swiftly before dynamite and crane, the abutment has turned over its function to the coffer dam. The photo was taken May 25, 1951.

MIGHTY BY NIGHT as well as by day was the spectacle of the coffer dam standing guard as the last fragments of the abutment were cleared and preparations for the new headwall went ahead. Night work was an important factor in the coordinated schedule of construction.



STEEL AND TIMBER were the working ingredients as the intake and penstock began taking shape.

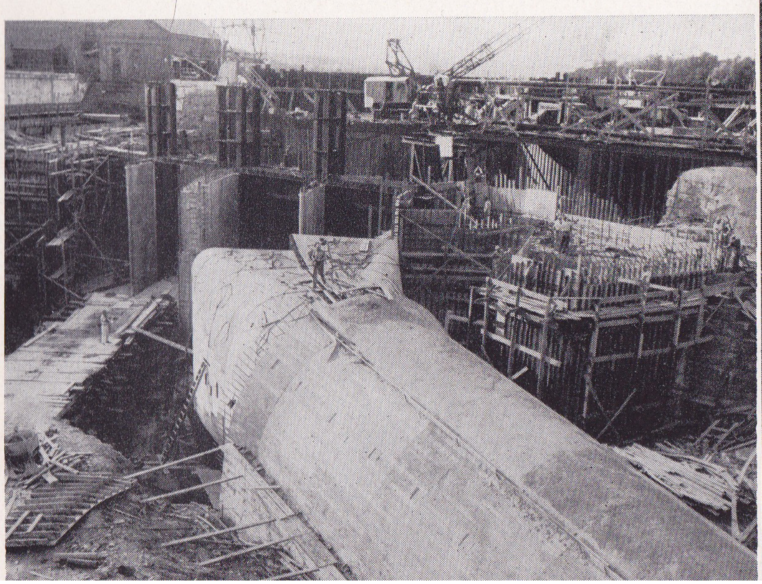


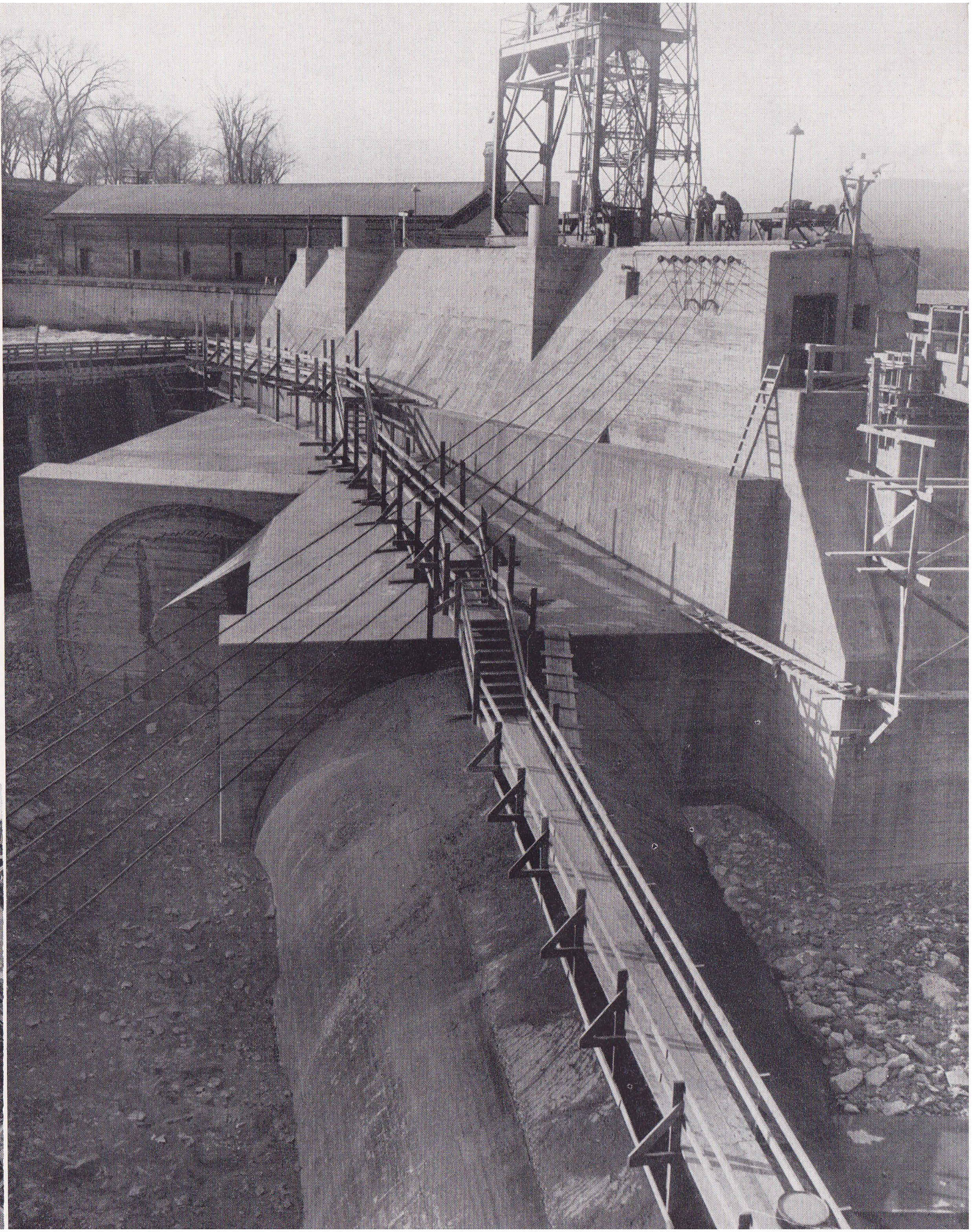
THROUGH SOLID ROCK went the excavation for the intake and penstock leading from the new headwall. The depth of the excavation dwarfs the men on the stairway at the center and on the ledge above.

READY FOR CONCRETE is the section of the penstock shown here. The permanent steel reinforcing rods are woven in place, making the pipe strong enough to withstand internal water pressure.

NEATLY MOLDED headwall is revealed by the stripping of the forms from the hardened mass of concrete. The traveling gantry crane atop the wall is used in raising and lowering the headgates. The board walk over the penstock and transition sections of the structure is temporary.

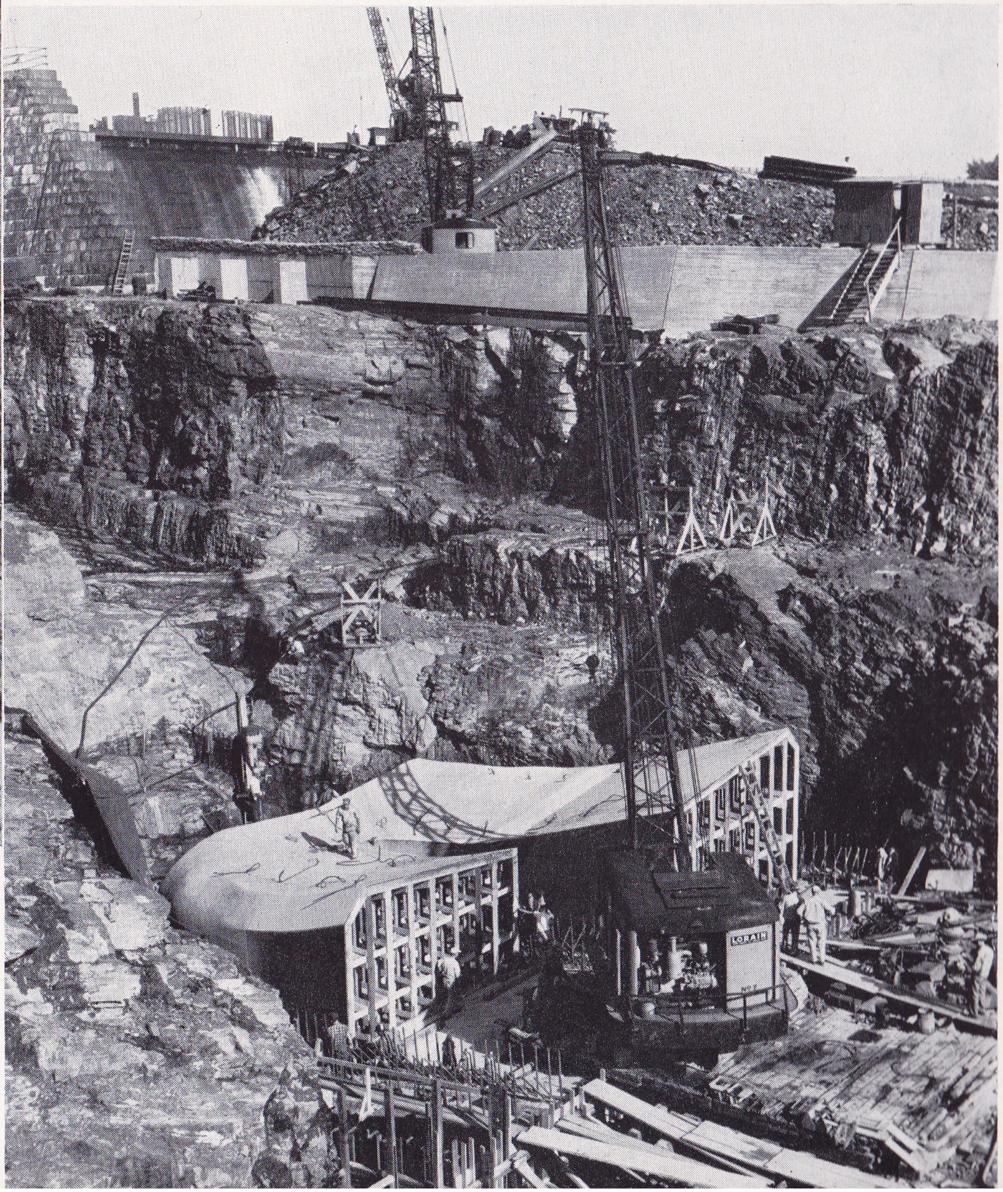
CONCRETE MANTLE for the penstock (*foreground*) takes shape as the headwall rises in the midst of forms and scaffolding. More than 165,000 square feet of forms were used in construction of the headworks and the substructure of the power house.

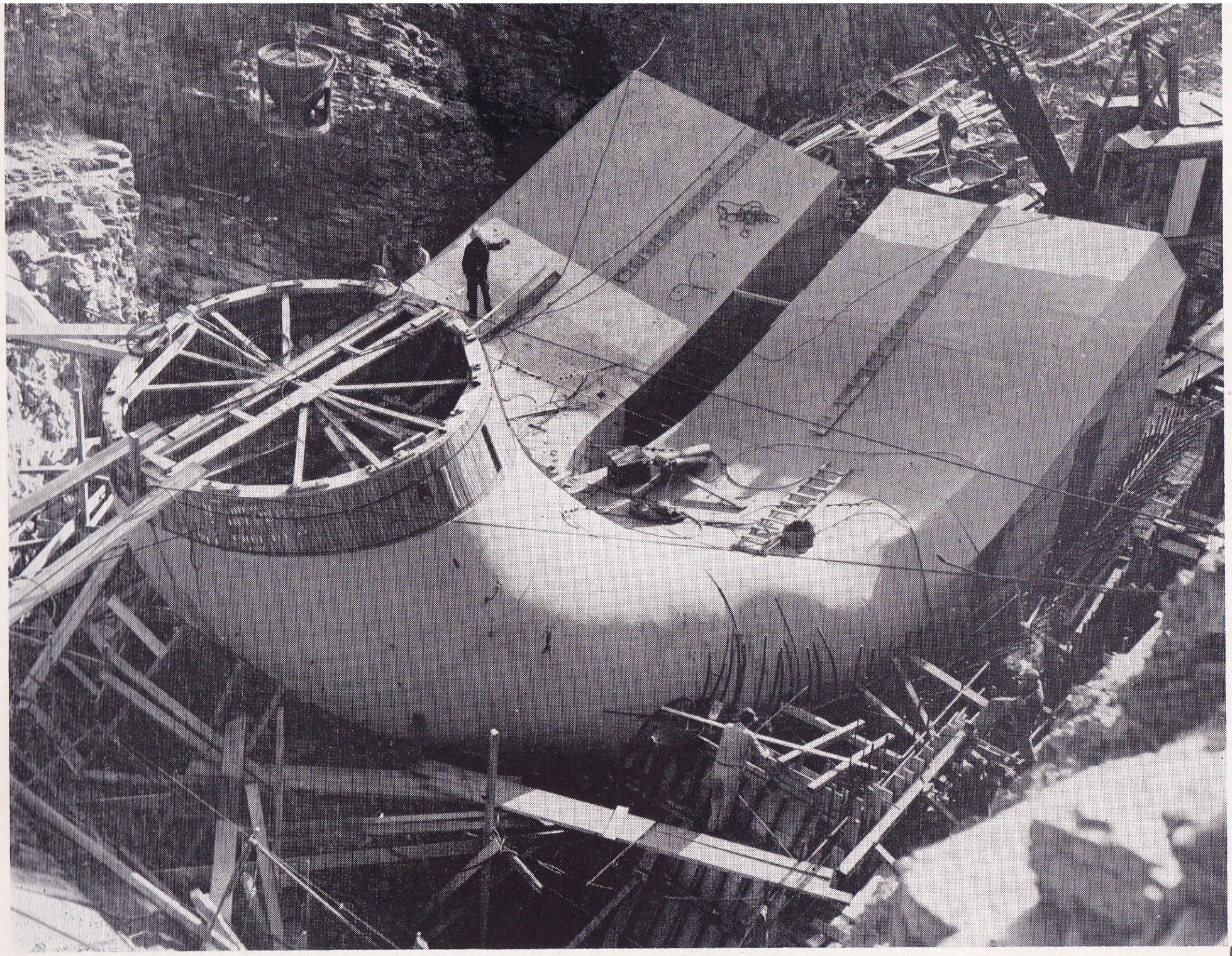




CRAGGY AND DEEP was the excavation for the substructure of the power house. The crane at the edge of the sixty-five-foot hole is hoisting rock fragments to the surface. The end of the old abutment is at the upper left. A training wall which serves to divert the river flow is shown just over the top edge.

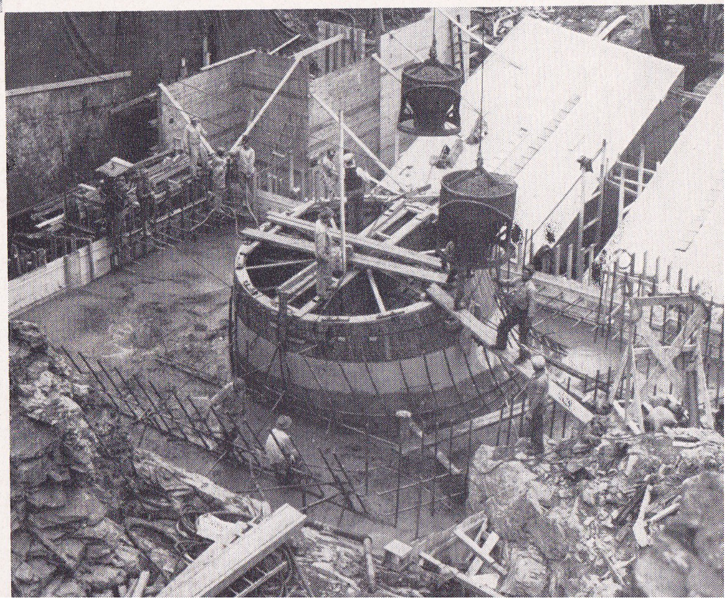
WATER OUTLET FORMS are installed in the depths of the substructure hole. These huge forms were built in advance on the river bank.

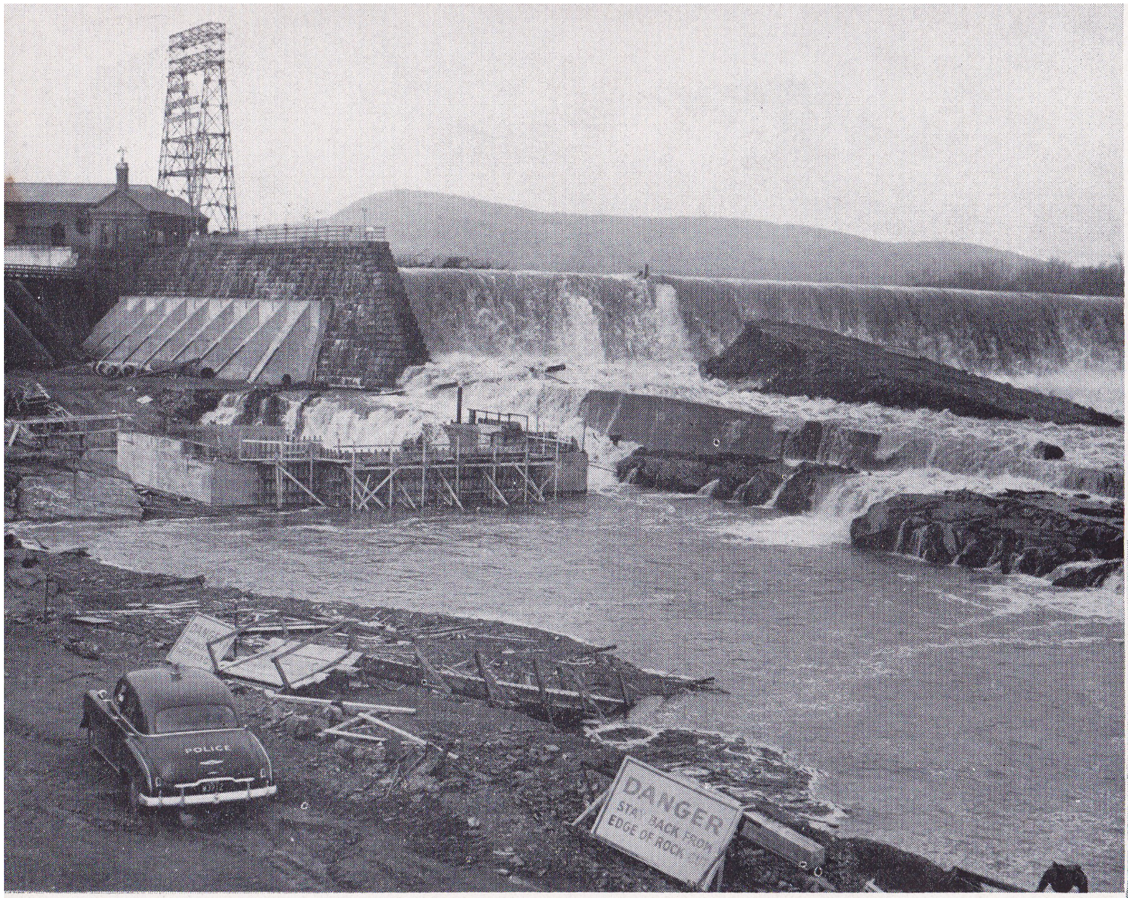




GIANT ELBOW leads to the twin-tailed exit of the water outlet. The passageway molded by this form takes the water as it leaves the water wheel and discharges it into the tailrace.

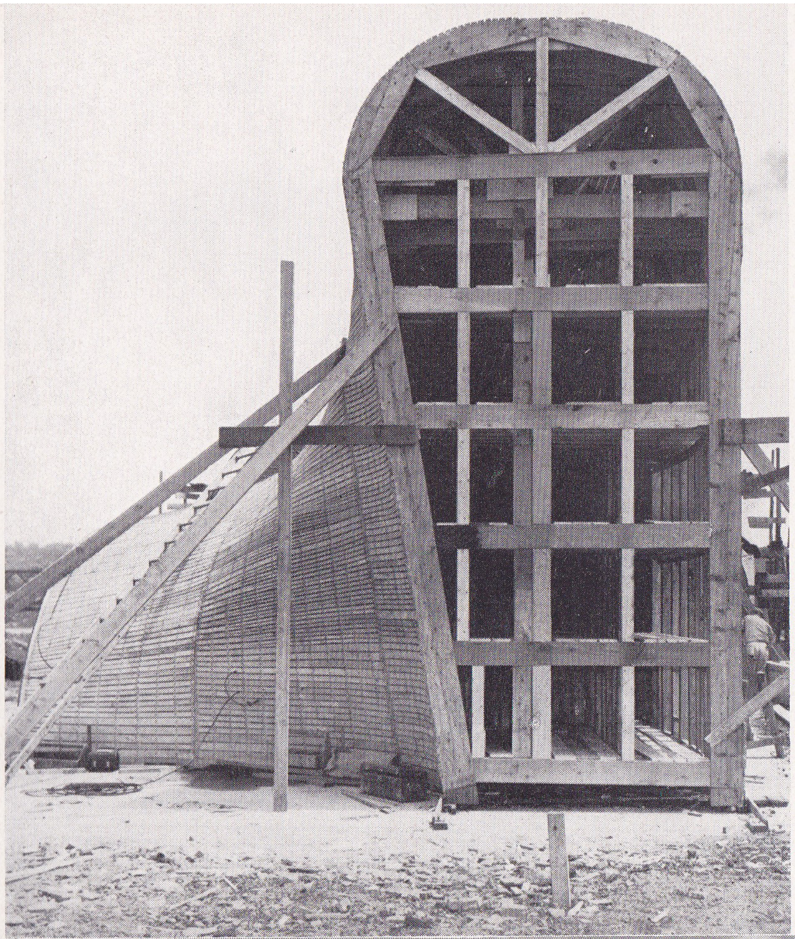
CONCRETE JACKET was applied to the outlet forms. The forms themselves, fashioned of wood, were removed when the concrete dried and hardened. Essentially, the power house substructure is a massive block of concrete with suitable holes for water passages.

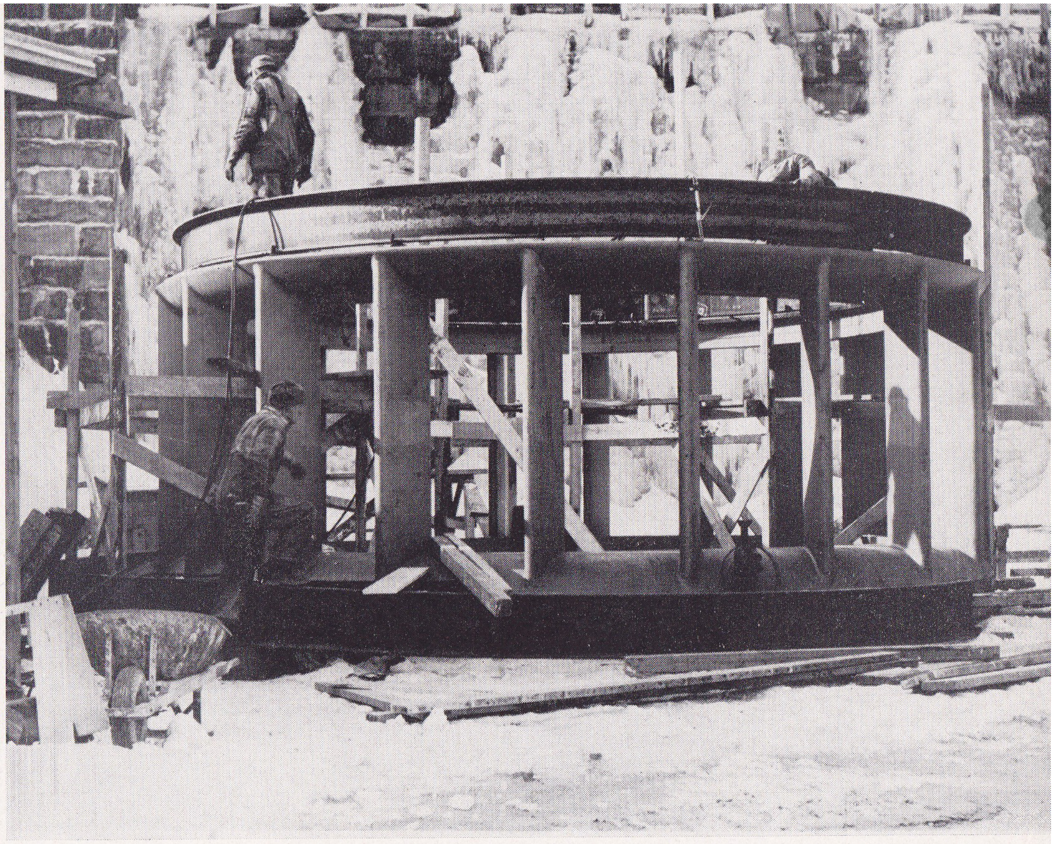




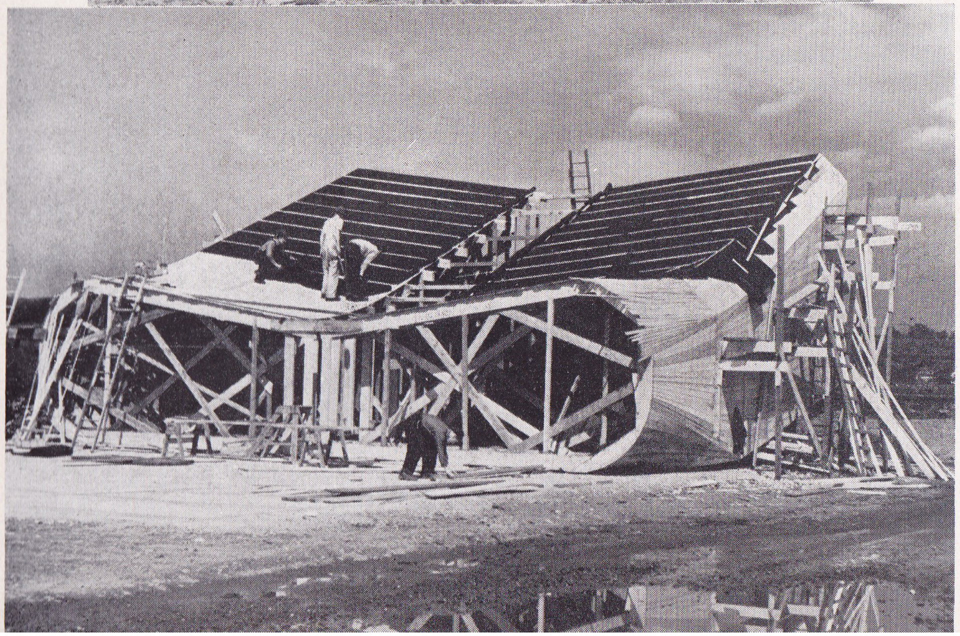
FLOODED OUT in November of 1950, work on the project was suspended temporarily. The substructure of the power house had been completed, however. The crest of the dirt ramp leading to the top of the dam had to be rebuilt before work could start on the coffer dam.

DRY AGAIN, with the aid of pumps, the twin outlets are seen in their finished symmetrical form. Under regular operation of the power station, these outlets will be permanently submerged.

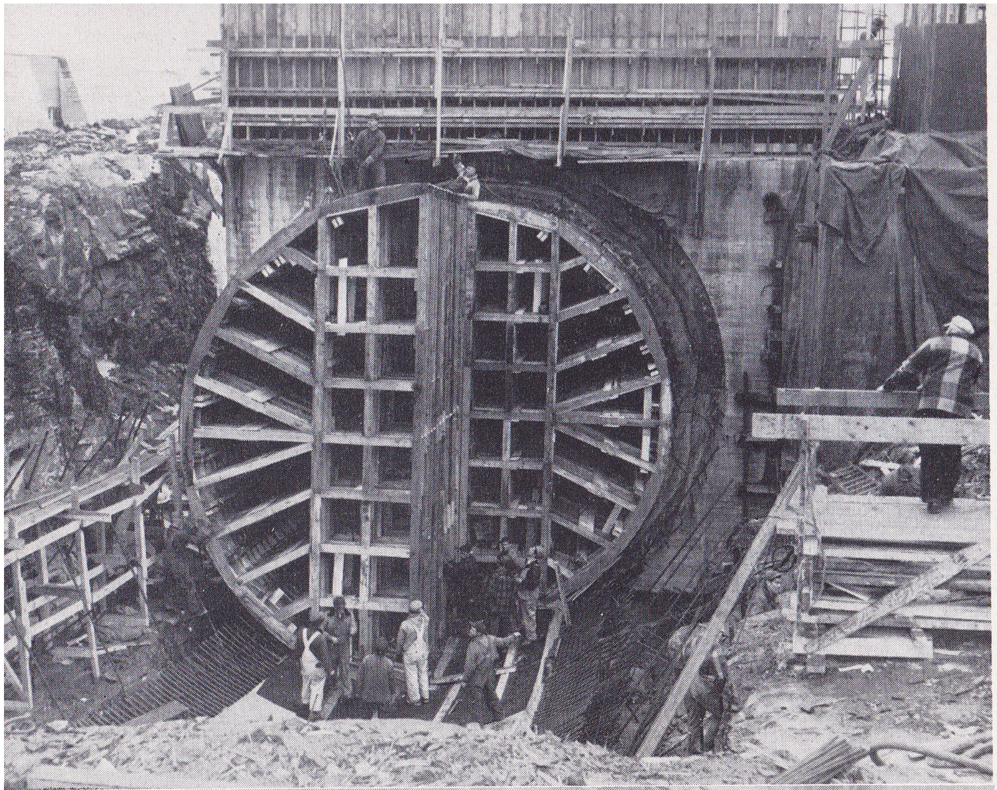


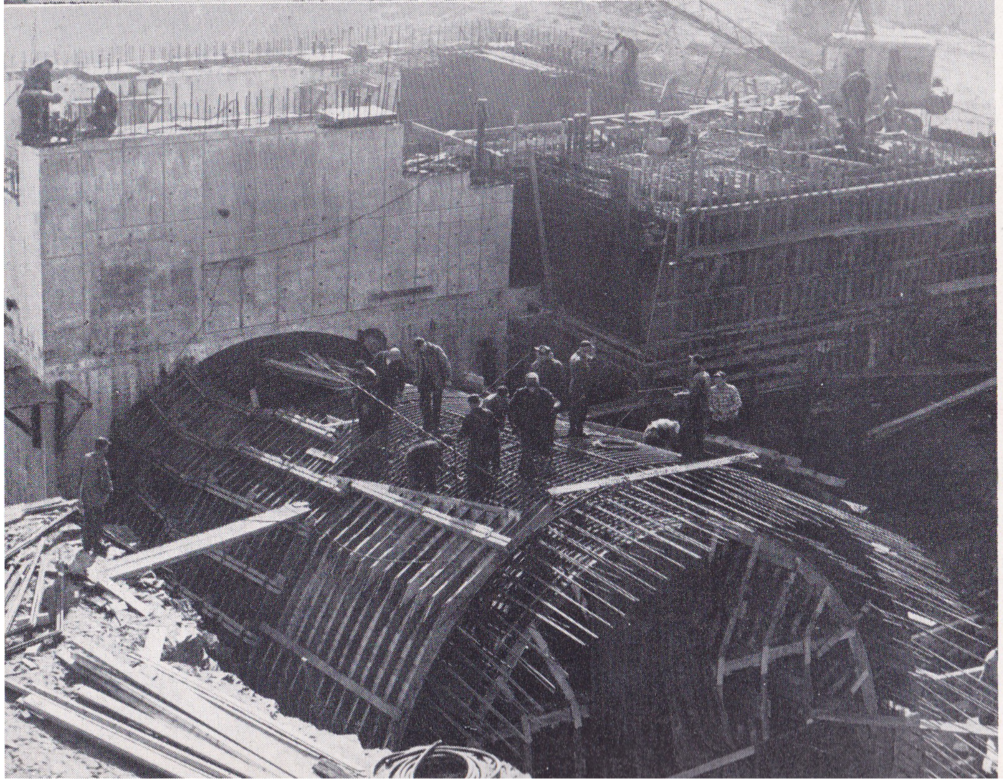


ICY BACKDROP sets off the scene as work goes ahead on the speed ring, part of the water wheel housing. Weather was never a serious obstacle.

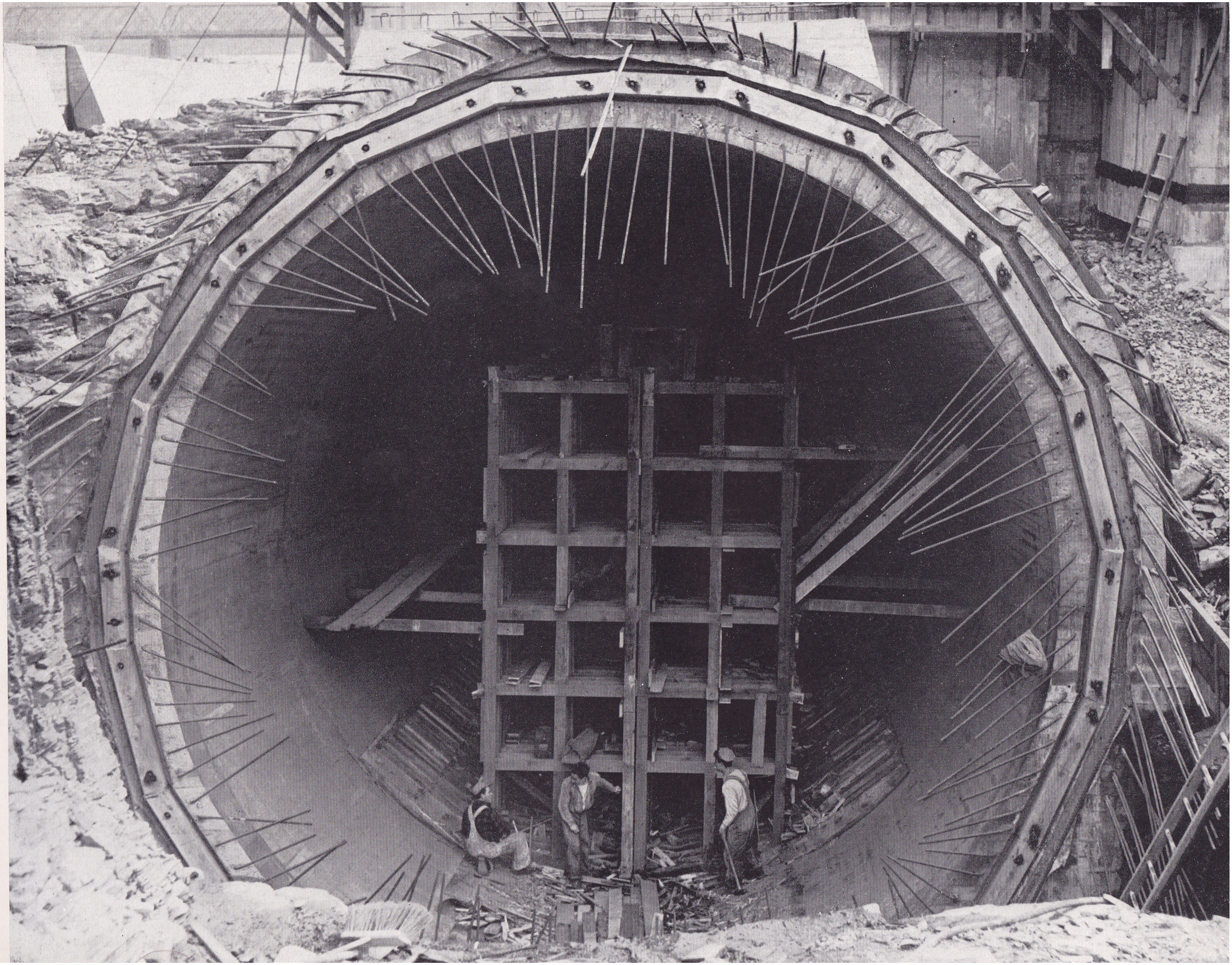


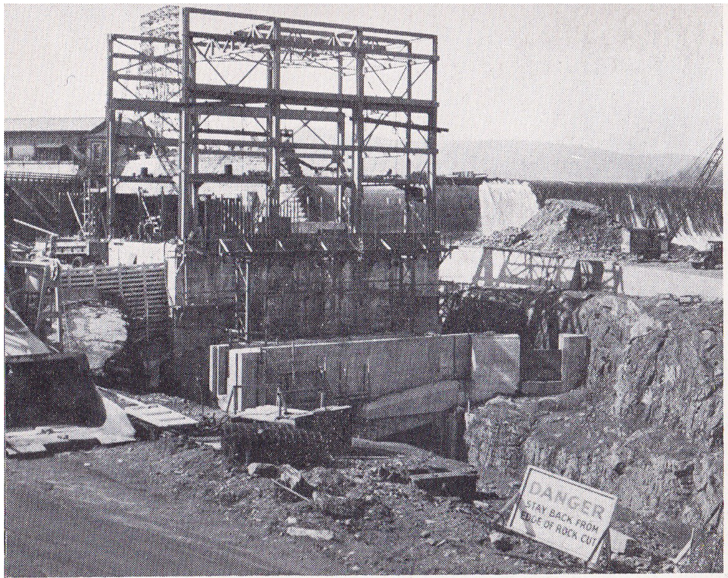
CO-ORDINATION was no small factor in the success of the construction schedule. As excavators cleared the river bed for the foundation, carpenters were assembling the forms for the water passages within the foundation. Two of these forms are shown at the left of the page.





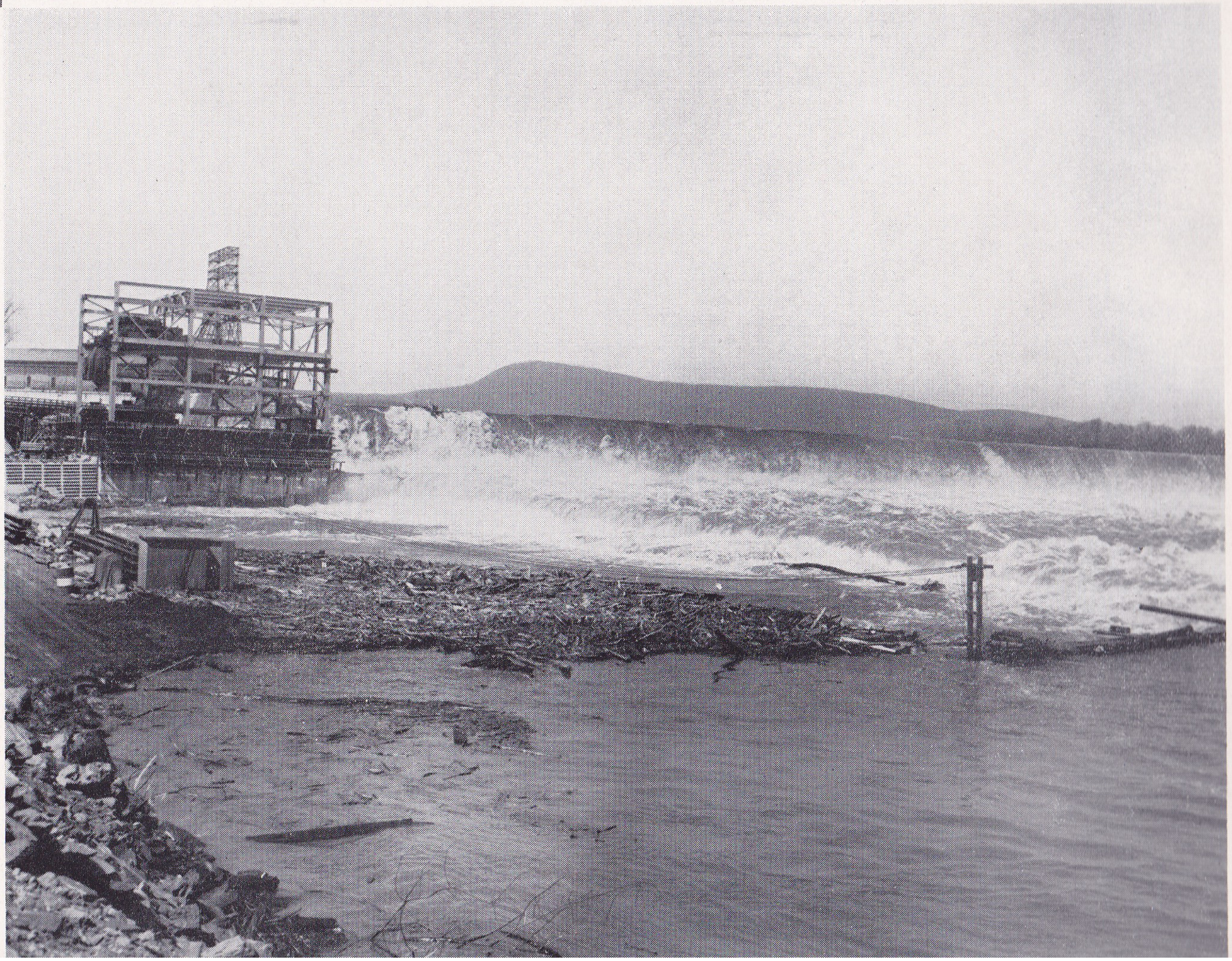
PENSTOCK SIZE is underscored by the comparative height of the workmen. At the upper left the forms are being swung into place at the entrance to the power house. At the lower left, steel ribbing is laid over the wood forms, and at the right the penstock has been cast in concrete and workers are removing the wood forms.

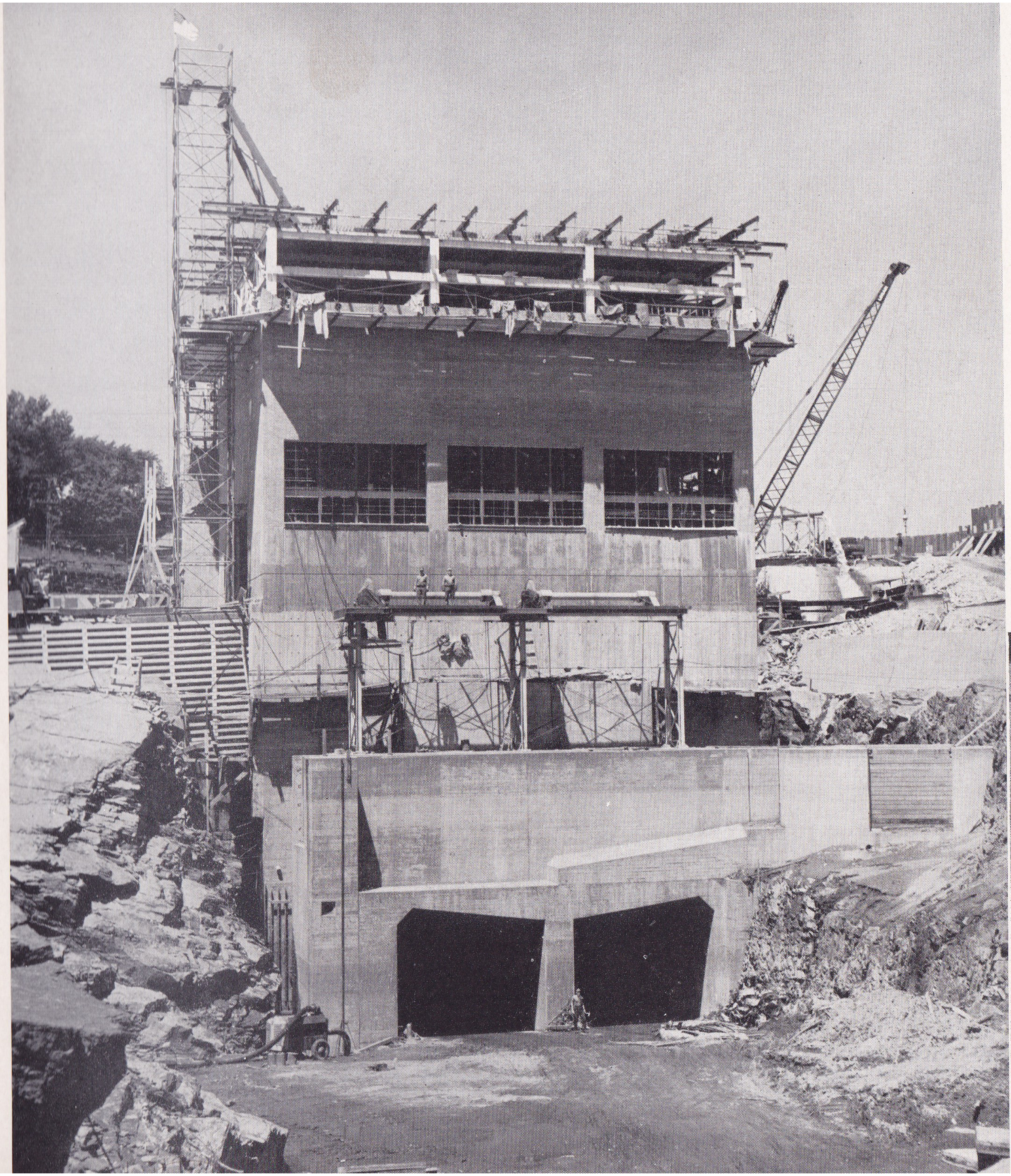




STEEL SKELETON for the power house rises seventy feet above the river bed. The framework for the permanent overhead crane of the station is already in place.

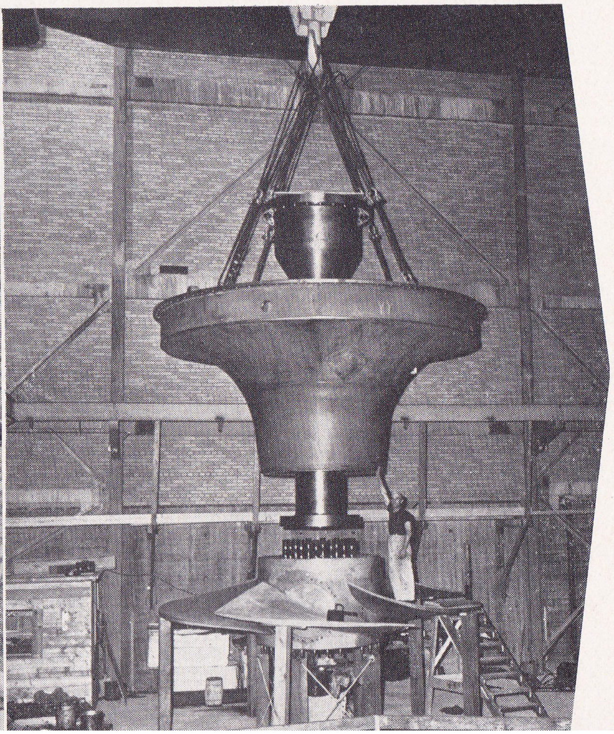
HIGH WATER in the spring of this year found the project far advanced, but considerable debris accumulated on the surface of the tailrace (*center*). The design of the new station is such that high water will not greatly interfere with its efficiency.





TOP-TO-BOTTOM expanse of the power house combines brick, steel, and concrete in an imposing facade. The high ceiling of the power house is necessary for the erection of generator parts by the overhead crane.

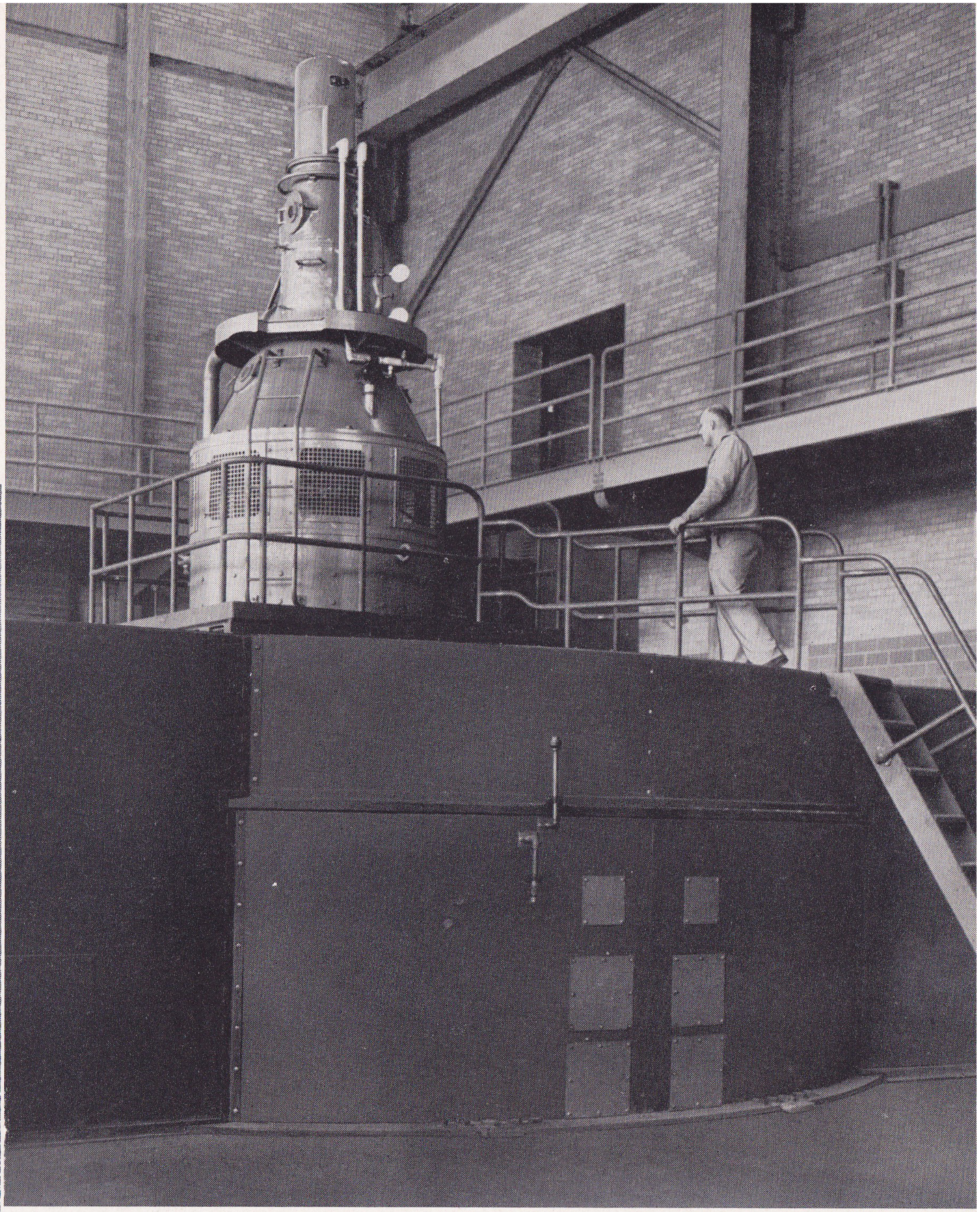
WATER WHEEL assembly is shown in process within the power house.



FULLY ASSEMBLED, the water wheel is being lowered into place far beneath the floor of the power house. Water directed through the substructure passages and against the large blades will rotate the wheel and turn the 15,000 kilowatt generator.

ONLY THE PINNACLE, or "turret" of the generator protrudes above the heavy metal casing. The turret contains accessory equipment vital to the functioning of the generator.

ENGINEER'S DELIGHT is reflected in the faces of manufacturers' representatives as the flick of a control panel switch engages the 15,000-kilowatt generator.




HOLYOKE
WATER POWER CO

FACTS ABOUT HOLYOKE WATER POWER COMPANY

Serves with electricity . . .

City of Chicopee Electric Light Department, Town of South Hadley Electric Light Department, major portion of Holyoke industry.

Serves with hydraulic power . . .

Industries on the Canal System, Holyoke Gas and Electric Department.

Serves with process water . . .

Industries on the Canal System, Holyoke Gas and Electric Department.

Serves with industrial steam . . .

Holyoke industries adjacent to its steam plants.

Serves with industrial rental space . . .

Small industries in its Norman Division, Beebe and Holbrook Division, Parsons Division and other locations.

Electrical connections to other utilities . . .

Holyoke Gas and Electric Department, Western Massachusetts Electric Company.

END AND BEGINNING of chapters in the power history of the Connecticut River at Holyoke is marked by the newly completed Hadley Falls Station of the Holyoke Water Power Co.

FACTS ABOUT THE NEW HADLEY FALLS STATION

Generator size . . .

15,000 KW — a little greater than one half of the total of hydro-electric units on the Canal System.

Generator voltage . . .

13,800 volts.

Water wheel . . .

Adjustable blade propeller type, 14 feet, 2 inches in diameter.

Quantity of water required . . .

4,000 cubic feet per second — 1,800,000 gallons per minute.

Size of penstock . . .

28 feet in diameter.

Normal head (or fall of water) . . .

50 feet.

Speed of unit . . .

128 revolutions per minute.

Construction time . . .

Two years and three months.

HISTORICAL FACTS

1792—Predecessor Company . . .

Proprietors of the Locks and Canals on the Connecticut River — built first navigation canal in America.

1827—Predecessor Company . . .

Hadley Falls Company (1) . . . small dam, canal, water power, factory.

1848—Predecessor Company . . .

Hadley Falls Company (2) . . . Holyoke's beginning . . . the first major dam . . . start of the canal system . . . development of mill sites.

1859—Holyoke Water Power Company . . .

was incorporated. Then, as now, building for the growth of this area.

1885 . . .

First commercial electricity in Holyoke by Holyoke Water Power Company.

1894 . . .

Canal system completed.

1900 . . .

Present stone dam finished.

1920 . . .

Beginning of major hydro-electric expansion.

1951 . . .

Completion of Hadley Falls Station.

THE COMPANY'S POWER PRODUCTION FACILITIES

The Holyoke Dam . . .

Thirty feet high, 1,020 feet long.

The Canal System . . .

Four and one-half miles long.

No. 1 Power Station . . .

7,640 KW of hydro-electric generation, 42,500 KW of steam-electric generation.

No. 2 Power Station . . .

2,900 KW of hydro-electric generation.

Beebe & Holbrook Division . . .

500 KW of hydro-electric generation.

Hadley Falls Station . . .

15,000 KW of hydro-electric generation.

This book is a product of Holyoke craftsmen . . . design, copy, photographs, art work, printing plates, paper, typography, printing and binding . . . all were produced within the city.